Realistic Dilemma and Legal Countermeasures against the "Non-Appropriation" Principle in Outer Space Treaty[1]

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The "non-appropriation" principle in Outer Space Treaty is of great significance in protecting the interests of all countries and the commonly inherited property of mankind. As the U.S., Luxembourg, etc. have claimed that countries or private entities can keep the right of ownership of outer space resources, the "non-appropriation" principle faces the realistic dilemma and legal challenges of unclear binding subject and low legal effect. Under the guidance of the thought "constructing a community of human destiny," the international community shall identify the applicable scope of the "non-appropriation" principle and regulate the non-government organizations' illegal possession and use of outer space resources; establish a special international institute of management for outer space resources by drawing lessons from the management mode of international seabed area; construct the development permission and notification mechanism for outer space resources to meet the needs of all countries in exploration of the outer space resources and achieve sustainable use of the outer space by mankind.

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Introduction

To maintain a peaceful development environment and achieve a win-win situation among all countries on resource development in outer space, in 1967, the United Nations formulated the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (hereinafter referred to as Outer Space Treaty). The Outer Space Treaty puts forth the "non-appropriation" principle that no appropriation of the outer space and celestial bodies therein by any countries by claiming, possession, use, or any other means (Treaty on Principles, 1967). To further strengthen the binding force of the "non-appropriation" principle on all countries and protect public properties against encroachment, there are also many other provisions matching and associating with the "non-appropriation" principle in the Outer Space Treaty, including the common interest principle, with which countries who develop and explore the outer space shall comprehensively protect interests of all member states; free exploration and utilization principle which clarifies that all countries shall, in strict accordance with relevant provisions of international laws and based on mutual equality and respect, access into all areas of celestial bodies in outer space freely; and international cooperation principle which appeals and advocates mutual-aid and cooperation among all sovereign states during exploration of outer space resources for the benefit of all mankind (Treaty on Principles, 1967). In consideration of the legal nature and ownership of rights, outer space is very similar to high seas, international seabed areas, the South Pole and the North Pole, belonging to the "commonly inherited property of mankind"; it has the following characteristics (Joyner, 1986):

1. Not owned by any countries, organizations or private persons.
2. All human beings have the right to explore and use the natural resource thereof.
3. Developers shall focus on the interests of all countries and share the profits from exploration with all countries and their citizens.
4. The outer space shall be for peaceful purposes specially, with no discrimination among all exploration countries.
5. All mankind and the descendants shall work together to fully guarantee the safe and sustainable use of outer space resources.

The United Nations General Assembly (UNGA) published an international convention and a resolution to reiterate the "non-appropriation" principle in Outer Space Treaty. For example, on December 5, 1979, the UNGA adopted the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement). It stipulates in Article 11 that celestial bodies (including the moon) and their resources are the common heritage of mankind, and the natural resource on and below the surface of the moon shall not be the property of any countries, governments, international non-governmental organizations, non-governmental entities or any natural persons (Agreement, 1979). Apparently, it is basically consistent with the provisions in Article 2 of the Outer Space Treaty, reconfirms the common attribute of outer space resources and promotes the "non-appropriation" principle to be a basic international custom rule (Lee, 2004).

Since its establishment, the "non-appropriation" principle has played a crucial role in regulating and controlling the behavior of exploring outer space resources by developed countries, developing countries, domestic organizations, and citizens. According to the "non-

appropriation" principle, developed countries shall, on the basis of no discrimination against developing countries and in accordance with the Outer Space Treaty and other relevant Laws of Outer Space, explore and use outer space resources legitimately to meet their and their citizens' growing demand on natural resources; for developing countries, the principle provides them opportunities for fair participation in the competition, expands their and their citizens' living space and changes to a certain extent the traditional international pattern that dominating the development of outer space by western powers. In a word, the "non-appropriation" principle is conducive to maintaining the sustainable development of natural resources in outer space and the common interest of mankind. All countries shall observe it strictly during resource exploration and give priority to the Outer Space Treaty as a "constitution of outer space."

1. Realistic challenges and legal dilemma against "non-appropriation" principle

With the exploration for outer space goes deep constantly and the exploration technology improves increasingly, the United States, Luxembourg and International Telecommunication Union (ITU) formulated legislation that permitting private entities or countries to possess, use, transport and sell natural resources in outer space, arising high question and strong dissatisfaction from the international community. Moreover, in the long-term judicial practice, the "non-appropriation" principle exposes its legal dilemma gradually in unclear subject definition and weak legal binding effect, posing a serious threat to the safety of common properties of mankind (natural resources in outer space). The realistic challenges and legal dilemma against the "non-appropriation" principle are specifically shown in the following two aspects.

1.1 Realistic challenges: concept conflict and influences to international security and stability

To accelerate the competition in outer space resources and seize the high ground of outer space, presently, some developed countries indulge and even encourage their private subject to explore, develop and use outer space resources, and publicize vigorously the concepts "countries who explore gain the ownership" and "outer space resources can be appropriated" (Liao, 2018: 40), which breach apparently the "non-appropriation" principle that has been accepted in the traditional international law on outer space and are highly likely to reduce the market share of outer space and damage the expected benefits of other countries, in particular to developing countries. On November 25, 2015, the former U.S. President Barack Obama published The U.S. Commercial Space Launch Competitiveness Act. According to the provision "exploration and use of outer space resources" in Chapter IV of the Act, U.S. citizens are gifted with the mining rights for outer space of near-earth asteroids (Bennett, 2018) and the freedom of possessing, transporting, selling and using resources in asteroids and other spaces (H.R. 2262-U.S., 2015); the Act also stipulates that unless making the United States to breach the international obligation, the federal government shall not restrict enterprises and citizens to develop outer space resources by setting administration barriers (Li, 2017: 1576) so that private entities can have the ownership of outer space resources without disturbance and implement effective management for them.

On July 13, 2017, Luxembourg, after drawing lessons selectively from the concept "countries who explore gain the ownership" put forth by the United States, formulated the Law

on Exploration and Use of Outer Space Resources (Draft Law, 2016). It stipulates explicitly that operators who propose to explore for commercial purpose and use outer space resources (state-owned companies limited by shares, partnership companies limited by shares and limited liability companies stipulated by laws of Luxembourg or European companies registered in Luxembourg generally) shall submit a written application to relevant department in advance and can obtain the rights of exploring, mining and possessing outer space resources with the permit and approval from corresponding approval institutions (Draft Law, 2016). Since then, Luxembourg has become the first European country stipulating the "appropriation of outer space resources" by legislation.

Also, ITU distributed geostationary orbit resources to different countries according to "historical method" and "plans ahead," bringing in severe challenges to the "non-appropriation" principle. The "historical method" requires member states to register in the International Frequency Registration Board (IFRB) (an organization under ITU) before using radio frequency, and countries registered ahead shall be given priority to use the radio frequency; according to the "plans ahead," the geostationary orbit resources shall be distributed to each country by portions to getting out of the limit by registration time (Cao, 2007). There are large differences between the "historical method" and the "plans ahead." Still, they both acknowledge directly or indirectly the claim that "outer space resources can be owned by countries," coinciding with the legislation of the United States and Luxembourg.

All countries over the world have attached great importance to the attribution of rights for natural resources in outer space since the proposal of the concept that "private entities or countries can possess the outer space resources" by the United States, Luxembourg and ITU. According to the provisions of classical Roman private law, the prior possessor can only claim ownership and implement effective management for ownerless lands (Zhou, 2004: 250). In light of outer space, it is stipulated explicitly in the Outer Space Treaty and other relevant treaties that natural resources in outer space and all celestial bodies therein are the commonly inherited property of mankind. The outer space does not belong to the prior possession subject as stipulated in the International Law, and no country or private person can appropriate the natural resources therein in the excuse of prior possession. For this reason, most countries hold that the behavior of the United States, Luxembourg and ITU. However, it can arouse to a certain extent the enthusiasm of private entities or countries on outer space exploration and create more economic benefits, breaches seriously the international customary rule "non-appropriation" on outer space use. In addition to the illegality, the behavior is likely to intensify the geopolitical relations of all countries in the outer space field, endanger the international relationship, destabilize international security and stability and damage the legitimate interests of all mankind. As claimed by Belgium on the 55th session of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPOUS): "if an entity has too much freedom when acquiring resources, its free access right may be restricted greatly; once the right of acquiring resources cannot be balanced in different countries, offensively inflated 'bright line' zones and fighting for lands may emerge."

In a word, the concept of the United States and Luxembourg that "countries or private persons can enjoy sovereign rights over outer space resources" is inconsistent with the "non-appropriation" principle and brings in realistic challenges to the safety of outer space, and is resisted and opposed by international community.

1.2 Legal dilemma: unclear subject definition and low legal effect

As previously mentioned, the Outer Space Treaty stipulates only no appropriation of the outer space and celestial bodies therein by any countries by claiming, possession, use or any other means, but fails to specify the restriction to the non-governmental organizations, social groups and private entities; it is very fuzzy and uncertain, and thus offers plausible excuses for some non-governmental organizations and private entities in wanton possession, use or sale of outer space resources. There are huge gaps remaining among countries in juridical practice. Some countries hold that, as an important part of countries, the rights of social groups and private entities depend fully on the authorization of the countries. According to the Outer Space Treaty, no countries can claim sovereignty for outer space. It is more impossible for non-government organizations to develop outer space resources beyond countries without control. From this point, the National Aeronautics and Space Administration (NASA) made a decision for the "case Gregory Nemitz claiming private rights for asteroid 433" that rejecting Gregory Nemitz's claims since his theory "individuals can possess celestial bodies" was lack of relevant legal support (Hobe et al., 2017). In the case of selling lands on the moon of the Lunar Embassy to China, the People's Court of Haidian District, Beijing said that no countries and their citizens and organizations have the right to claim ownership of the moon. Nevertheless, some countries still claim that individuals shall possess any parts of the outer space legitimately on behalf of themselves or other individuals, private groups, and international organizations (Gorove, 1968). They permit and even strongly support their private entities in possession, exploration and use of outer space resources, and the United States and Luxembourg bear the brunt. Up to now, the international community still fails to reach an agreement on the scope of the binding subject of the "non-appropriation" principle. This could feasibly cause some countries who expect to gain much profit in the outer space field to instigate their domestic private entities to possess and develop in large scale the natural resource in outer space, bypassing the Outer Space Treaty, and thus damaging the lawful rights and interests of other countries and their citizens.

Besides the unclear binding subject, the "non-appropriation" principle has an internal logic dilemma that its legal binding force derives from and depends on the "state sovereignty" principle, showing low legal effect. It is specially shown in the following two aspects: first, the establishment of the "non-appropriation" principle. The Outer Space Treaty has the same legal nature and characteristics as general treaties. It produces a legal binding force only on sovereign states who join in and approve it and cannot be used as the legal basis for managing and controlling non-contracting or acceding states. In other words, only countries who acknowledge the "state sovereignty" principle can join in the Outer Space Treaty and are bound by the "non-appropriation" principle. It means that the "state sovereignty" principle is the premise for the "non-appropriation" principle. Second, the alteration of the "non-appropriation" principle. With the exploration technology for outer space resources improve day by day and the demand for natural resources constantly increases in different countries, some countries attempt to possess outer space resources wantonly by shaking and changing the position of the "non-appropriation" principle in international laws of outer space. Suppose more and more countries question or object to the rationality of the "non-appropriation" principle. In that case, predictably, all parties are highly possible to formulate new treaties and rules following the state sovereignty principle to break free from the "non-appropriation" principle.

We hold that the "state sovereignty" principle, as the logical basis and core belief of the existing international legal system, will almost produce legal binding force to all countries and is difficult to alter and substitute. On the contrary, the "non-appropriation" principle binds only the countries approving or joining in Outer Space Treaty and is not the unalterable basic legal principle; its legal effect is much weaker than the "state sovereignty" principle (Zhao, 2019: 26).

2. Legal countermeasures of the "non-appropriation" principle in the "new era"

In 2017, China promoted the construction of a community of human destiny and built an open and inclusive new era that enjoys lasting peace, universal security, and common prosperity. The proposal of constructing a community of human destiny offers a good program for the improvement of the "non-appropriation" principle largely; all countries can, with this opportunity, clarify the applicable scope of the "non-appropriation" principle furthermore, establish a special international institute of management for outer space resources and construct the international development mechanism for outer space resources. Especially, the international community may set about from the following three aspects.

2.1 Clarify the scope of application of the "non-appropriation" principle

The "non-appropriation" principle in Outer Space Treaty provides "sovereign countries are not entitled to the ownership of outer space resources," but domestic private entities and non-governmental organizations are not included in the scope of the restriction. This vague and uncertain expression has led to the encouragement in free development and commercialization of foreign space resources in the United States, Luxembourg and other countries, which is extremely easy to harm the economic interests of other countries, especially the underdeveloped countries. Based on this, we believe that all parties can clearly define the subject scope of the "non-appropriation" principle by amending the Outer Space Treaty, the Moon Agreement and other international conventions. However, due to the huge gap between countries in the technology of exploiting outer space resources and difficult coordination on the interests of countries, it is difficult for all countries to reach an agreement on whether the "non-appropriation" principle should restrict private entities within a short period of time. Therefore, considering the balance of interests of all mankind and the actual level of development of all countries, the international community should adopt a relatively neutral and relaxed attitude, establish a concept of combining principle with flexibility and generality with the exception, and provide different provisions on the ownership and usufruct of space resources. As far as ownership is concerned, the natural resources in outer space belong to the common heritage of mankind, which is related to the survival of all mankind and the interests of every country. In order to truly make outer space a "resource treasury" for mankind and prevent some scientific and technological powers from infringement of the interests of other countries or regions through abusing their legal rights, all parties shall broadly interpret the Article 6 of the Outer Space Treaty ("all countries shall bear international responsibility for their space activities, no matter such activities are carried out by government departments or non-government departments") (Treaty on Principles, 1967) as follows, the "non-appropriation" principle is not only binding on all parties, but also should strictly regulate the illegal occupation of outer space resources by any private entity or non-governmental organization" (Liao, 2018: 65).

However, suppose a "one-size-fits-all" approach is adopted to absolutely forbidden sovereign countries and citizens from exploiting any kind of outer space resources. In that case, the development subject's enthusiasm for exploring outer space and the exploitation of natural resources by various countries will surely be dampened. Therefore, the international community should, on the basis of the above provisions, attract the state and private entities to actively and continuously develop outer space resources through the provision of exception clauses to promote the leapfrog development of the economy and society. It mainly includes the following three approaches: first, the international community can grant sovereign states and private entities the right to freely explore, develop and utilize outer space resources, with a certain degree of restrictions on the conditions, extent and scope of the exercise of this right; secondly, under the guidance of the concept "the development of outer space resources is in the common interest of all mankind," actual developers are given limited rights of income and benefits from outer space resources. According to the different roles and contributions of various countries during the development, rights and interests are allocated in a targeted way and the development between countries with developed, underdeveloped or even completely non-space capabilities is balanced (Zhao & Jiang, 2018: 90); thirdly, referring to the eligibility conditions of land miners in Jus Privatum, all stakeholders are required to pay appropriate considerations to the owners of outer space resources or specialized international space agency in exchange for the right of exploitation and utilization of outer space natural resources, on the premise of following the "non-appropriation" principle and corresponding management mechanisms (Liao, 2018). Therefore, a win-win model of cooperation between actual and non-actual developing countries is established to fully protect all parties' legitimate rights and interests in outer space.

To sum up, we think it should provide private entities and non-governmental organizations not entitled to the ownership of outer space resources, but are granted the right to develop and utilize them according to the law rationally. The principle of "non-development oriented, supplemented by limited development" is suggested to adopt, thus realizing the balance between the protection of the common heritage of mankind and all countries' interests in the field of outer space development.

2.2. Establishment of a special outer space resources agency

In view of the public nature and transnational nature of the international seabed area and outer space, through learning from the experience and lessons of the international seabed area system construction and the management mechanisms and models of various countries for the international seabed area, the international community can establish an outer space resources agency (internal space agency) similar to the International Sea-Bed Authority to rationally allocate outer space resources and balance the interests of all parties.

As we all know, the Outer Space Treaty repeatedly stresses, the natural resources in outer space belong to the common heritage of mankind, and any subject exploiting them must benefit the development of all parties. Therefore, while establishing the international space agency, the international community should take the lead in developing the concepts of "non-appropriation," common interests, free exploration and utilization, equal development and sustainable development to deal with the coordination and conflicts between the countries with powerful and weak space capabilities. Under the guidance of such principles, space resources agencies should also include as many member states as possible to lay a solid organizational foundation. In general, international space agency can choose the following categories of countries as his member states (Lee, 2009: 588):

1. Countries that are capable of fully exploring and exploiting outer space.
2. Countries with financial investment capability.
3. Any member state of the United Nations.
4. Any independent sovereign country or region.

In this regard, we believe that the first two methods only grant the powerful countries of outer space science and technology and finance the right to exploit natural resources in outer space, which obviously violates the principle of common interests of mankind, deprives developing countries or regions of the qualification for exploration and benefits, and is not in line with the development trend of international space activities. Comparatively speaking, the third method is reasonable in theory. According to the UN Charter, no member state may interfere in the internal affairs of other countries. Specifically, in the field of outer space, this provision is conducive to preserving the exploitation rights and benefits of non-actual developing countries in outer space, but its reasonability still needs further verification in practice. The fourth method takes whether the country enjoys independent sovereignty as a unified standard to measure if the applicant country meets the qualification and conditions for joining the international space agency, thus guaranteeing the rights of all parties to enter the international space agency on an equal basis. It will inevitably develop into the main method generally followed by all countries (Teng, 2016).

In addition to establishing advanced design concepts and attracting more sovereign countries to join space resources agencies, the international space agency should also set up internal organizations with different authorities and responsibilities. Specifically, first, the international space agency may set up a conference of member states, which will be responsible for formulating general policies and regulations, approving the accession or withdrawal of member states, and considering and adopting comprehensive matters such as fiscal budgets; secondly, all major power, weak countries and middle countries in aerospace may consider sending a certain proportion of representatives to form a permanent council, which is responsible for handling the daily administrative examination and approval of the agency and making up for the consequences of delay holding of the conference of member states; thirdly, set up a special finance committee to manage the drafting of financial rules, collection of membership fees and permission fees from member states, etc.; fourthly, establish a dispute settlement institution; fifth, establish related executive institute; sixth, in order to ensure the rational exploitation of outer space resources by various countries and regulate the improper exploitation by development entities, the outer space resources agency should establish an effective internal evaluation and audit institution (Zhao, 2017), mainly including legal, environmental and scientific and technological inspection departments.

In short, the international community should, under the guidance of the Outer Space Treaty and the "non-appropriation" principle, call on sovereign states to actively set up specialized outer space resources agencies and internal departments to create a systematic, complete and comprehensive operational governance mechanism.

2.3 Construction of international resource development permission and notification mechanism

In judicial practice, some states and non-state entities will harm other countries' ownership and usufruct outer space natural resources by abusing their rights. In order to prevent such phenomena and protect the common heritage of all mankind, the international community can

consider establishing a space resource development permission and notification mechanism. Specifically, it mainly includes two aspects:

First, in order to ensure countries, organizations and individuals engaged in actual development activities exploit outer space resources rationally, the international community should require development subjects to strictly follow the permission procedures stipulated in relevant international treaties, for example, complete the application and registration procedures with the international space agency in order to obtain the development permission documents. First, formal review. The applicant should prove its qualification for the development of natural resources in outer space by submitting supporting materials such as patent technology, investment certificate and existing development experience, and provide a detailed proposed plan for the Council, which includes the purpose, regional scope, methods, years and expected results at different stages of exploitation, impact on the environment, cooperation programs with other countries, and disputes resolution. After that, the international space agency should conduct a preliminary formal review of such materials. If the materials submitted by the applicant are complete without any apparent defect, the application procedure is accepted and can proceed into the second stage. Otherwise, the international space agency shall return the materials not conforming to the relevant regulations to the applicant timely with an explanation of refusal to enable the corresponding amendments or supplements to the materials by the applicant; secondly, substantive review. International space agencies should further carry out a substantive review for those who have passed the preliminary review, for example, transfer materials to the specific examination institutes by types of supporting documents. Such relevant institutes shall provide the examination results truthfully for the international space agency within 45 days. The international space agency should decide whether the applicant can proceed into the next review stage within 30 days. In addition, for those who failed the substantive review, the international space agency will require them to submit an improved development plan and supplementary supporting materials within 60 days for review again; in the end, the voting shall be organized. International space agencies should hold a conference of member states to vote on the applicant's qualification on the exploitation of outer space resources, and finally issue a permission certificate to those who passed the voting, i.e., eligible subjects.

Second, to enable interested parties to beforehand learn the development of outer space resources in other countries and protect their legitimate rights and interests, the international space agency should require all parties to widely inform other countries of its development plans by establishing an outer space exploitation notification mechanism. The notification mechanism may include the following contents: First, any party is obliged to notify the international space agency and the whole international community of its exploitation activities; secondly, upon acknowledging another country's plan for exploitation which is exactly located in the same area simultaneously engaged by one party itself, this party should immediately notify its exploitation time, plan and other relevant contents to the other so as to protect the interests of the first developers from infringement. Finally, states, non-governmental organizations and private entities should report any phenomena found in outer space that may pose a threat to human life or any other organic life phenomena to the international space agency and the whole international community (Zhang, 2010: 33).

The international space agency should select subjects that meet the conditions of exploitation by establishing an outer space exploitation permission and notification mechanism to ensure the rights of non-actual developing countries to explore and utilize outer space freely.

Conclusions

In recent years, the earth has been unable to meet the ever-increasing demand of human resources for uncontrolled exploitation and wanton destruction of natural resources in order to increase their resource reserves and compete for the commanding heights of the "resource war" in the new century, various scientific and technological powers are competing to take the outer space, the so-called "resource reserve," as another key development goal after the earth. In judicial practice, some countries and international organizations such as the United States, Luxembourg and the ITU allow private entities or countries to openly possess, use, transport and sell natural resources in outer space in violation of the "non-appropriation" principle, in order to seize huge illegal benefits and take the lead in competing for space with other countries. In addition, the "non-appropriation" principle has gradually exposed the legal disadvantage and loopholes of unclear binding subject and low effect, making this international custom rule subject to unprecedented practical challenges and theoretical impact. In this regard, we suggest that the international community should clearly define the scope of application of the "non-appropriation" principle and provide corresponding provisions on the issue of ownership and usufruct of outer space resources through a combination of generality and exception. An international space agency should be established to strengthen the unified jurisdiction of all parties. A space exploration permission and notification mechanism should be established to protect the common heritage of mankind and the legitimate rights and interests of all countries.

🕮 References

Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (1979) United Nations Office for Outer Space Affairs. Available online: http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html

Bennett, Trin C. (2018) To Infinity and Beyond: the Future Legal Regime Governing Near-Earth Asteroid Mining. *Texas Environmental Law Journal*, Vol. 48, 10.

Cao, WenJuan (2007) A Study on Article 2 "Non-appropriation" Principle in Outer Space Treaty. *Master's Thesis of China University of Political Science and Law,* 32-33.

Draft Law on the Exploration and Use of Space Resources (2016) Article 2&3. Available online: https://www.abanlex.com/wp-content/uploads/2015/07/Draft-law-space_press.pdf

Gorove, Stephen (1968) Interpreting Article II of the Outer Space Treaty. *Proceedings of the Colloquium on the Law of Outer Space*, Vol. 11, 40.

Hobe, Stephan, Schmidt-Tedd, Bernhard, Schrogl, Kai-Uwe, Popova, Rada and Reynders, Martin (2017) *Cologne Commentary on Space Law* (Vol. 1): Outer Space Treaty, World Affairs Press, 74-75.

H.R. 2262-U.S. (2015) Space Resources Exploration and Utilization Act.

Joyner, Christopher C. (1986) Legal Implications of the Concept of the Common Heritage of Mankind. *International and Comparative Law Quarterly,* Vol. 35, 190-199.

Lee, Ricky J. (2004) Article II of the Outer Space Treaty: Prohibition of State Sovereignty, Private Property Rights, or Both? *Australian Journal of International Law*, Vol. 11, 134-135.

Lee, Ricky J. (2009) *Creating a Practical Legal Framework for the Commercial Exploitation of Mineral Resources in Outer Space*. Ph.D. Dissertation, University of Murdoch.

Liao, MinWen (2018) A Study on Determination of Legal Status of Outer Space Resources. *International Law Research*, Issue 2.

Li, ShouPing (2017) Free Exploration and Utilization of Natural Resources in Outer Space and Its Legal Limitations – A Perspective from Legislation on Space Resources in the United States and Luxembourg. *Peking University Law Journal*, Issue 6.

Teng, LuLu (2016) *Research on the Construction of Legal Mechanism for Exploitation of Celestial Resources in Outer Space*. Master's Thesis of Shandong University, 30-31.

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967) United Nations, Treaty Series, Vol. 1363, № 23002. Available online: https://www.state.gov/outer-space-treaty

Zhao, Wang (2019) *Dilemma Faced by the "Non-appropriation" Principle in Outer Space Treaty*. Masters Thesis of Liaoning University.

Zhao, Yun and ShengLi Jiang (2018) Analysis of Legal Nature and Right Ownership of Outer Space Resources – Construction of International Legal Mechanism for Exploitation and Utilization of Outer Space Resources. *Exploration and Free Views*, Issue 5.

Zhao, Peng (2017) *Construction of International Legal System for Exploitation of Outer Space Resources*. Masters Thesis of Zhengzhou University, 27-28.

Zhang, Jing (2010) *International System for Exploitation of Natural Resources in Outer Space*. Master's Thesis of China Foreign Affairs University.

Zhou, HaiZhong (2004) *International Law*. China University of Political Science and Law Press.